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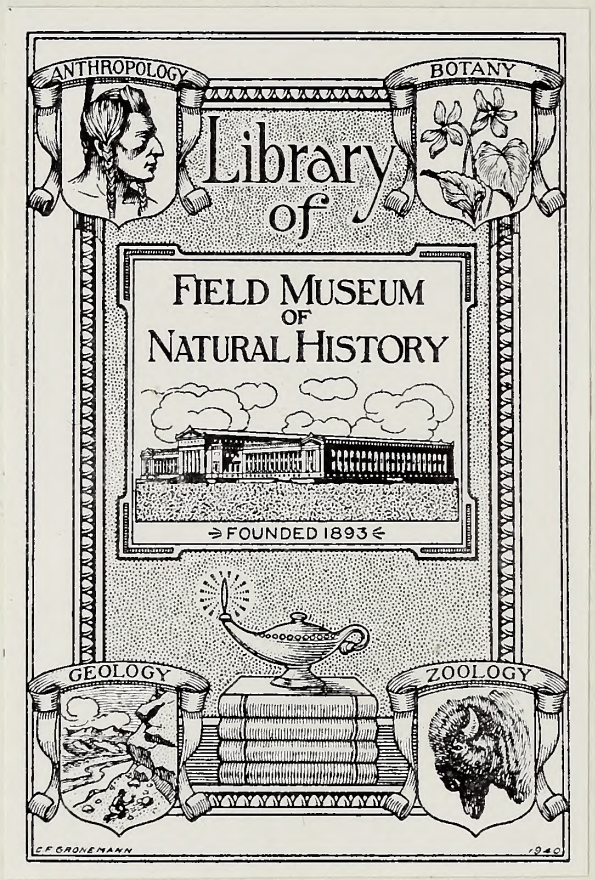

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The Vegetation of the Chicago Region

An outline of some of the principal plant associations together with lists of their principal species

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THE VEGETATION OF THE CHICAGO REGION

In this outline no attempt is made to treat exhaustively either the plant associations or the list of species composing them. Only the clearly defined associations easily accessible from the city of Chicago are included, more particular attention being given to those peculiar to this region. The names of weeds or ruderal plants are not included in the lists. For more detailed studies of these plant associations see COWLES, The plant societies of Chicago and vicinity, Geographic Soc. of Chicago, Bull. 2. 1901, and for the plants of the vernal flora see COWLES and COULTER, A flora for high schools, pp. 144. ill. New York: Amer. Book Co., 1915.

I. THE SAND DUNE AND UPLAND ASSOCIATIONS

The following paragraphs outline the well-marked succession of plant associations upon the sand dunes of the Lake Michigan shores near Chicago and include several of the more typical associations of the forested morainic uplands. Following the outline is a list of many of the characteristic plants of these associations, the name of each species being preceded by a number or by numbers corresponding to those of the association or associations in which it chiefly occurs. For details regarding the vegetation of the sand dunes see COWLES, Bot. Gaz. 27:95 ff. 1899. For evaporation and soil moisture conditions see FULLER, Bot. Gaz. 58:193–234. 1914.

1. **The beach association.**—The vegetation of the beach is scanty, consisting principally of xerophytic annuals together with a few perennial herbs and shrubs.

2. **The fore-dune associations.**—This region of embryonic dunes is characterized by the sand reed grasses and such shrubs as the willow and the sand cherry together with the herbaceous plants of the beach. Well-developed fore-dunes may be seen at Lake Bluff, Ill., Miller and Dune Park, Ind., and Sawyer, Mich.

3. **The cottonwood association.**—This is notably the area of actively moving dunes with sparse vegetation. The rate of evaporation is very high, but the water content of the soil remains very constant at a short

distance below the surface. The herbaceous and shrub vegetation of the previous associations persists with few additions. The dominant and almost the only tree species (*Populus deltoides*) gives its name to the association, but is occasionally replaced by the closely allied *Populus balsamifera*. The germination and development of these trees are dependent upon such moist areas as *pannes* and the margins of ponds. (See FULLER, Trans. Ill. Acad. Sci. 5:137–143. 1912.)

The cottonwood owes its successful establishment and permanence upon the moving dunes to its great powers of vegetative activity which is seen in the production of adventitious roots from the buried trunk and branches and also in the development of adventitious shoots from its uncovered roots.

4. The pine dune association.—Soon after the fixation of the dunes there develops an association succeeding the cottonwood and characterized by evergreens. Among the dominant plants are species of pine, juniper, and arbor vitae, together with an undergrowth in which the heath family is well represented in species of *Arctostaphylos*, *Pyrola*, *Gaultheria*, etc. The herbaceous and shrub vegetation becomes much more abundant and is composed of species quite different from those in the former association. Humus formation proceeds, but the water content of the soil is less than in the previous association on account of the greater demands made upon it by the increasing amount of vegetation. The evaporating power of the air is, however, much less, and hence permits the development of seedlings of oak and other trees which dominate the succeeding association. The pine association is short-lived, but the undergrowth finally shows very decidedly mesophytic forms, especially upon the north face of slopes. This association was formerly well developed over much of the area between Buffington and Gary, Ind., where a few remnants are still to be seen. It occurs between Miller and Dune Park, Ind., and in a modified form at Lake Bluff, Ill., and Sawyer, Mich.

5. The black oak dune association.—This forest association consists of a somewhat open and often almost pure stand of *Quercus velutina* with an undergrowth of rather xerophytic herbs and shrubs. The evergreen forms of the previous association disappear and are replaced by such shrubs as species of *Vaccinium*, *Rhus*, *Prunus*, *Sassafras*, *Viburnum*, etc., while noticeable among the herbs are species of *Solidago*, *Asclepias*, *Opuntia*, *Smilacina*, etc. Soil moisture and evaporation conditions differ but little from those of the previous association, and the increase of humus in the soil is very slow. The association apparently persists for a much longer time than any of its predecessors, and is seen exten-

sively developed near Miller, Ind., but is common throughout the entire dune region of Indiana and southern Michigan.

6. The mesophytic oak forest association.—Upon the sand dunes this gradually develops from the preceding by the coming in of other and more mesophytic tree species, notably such oaks as *Q. alba* and *Q. rubra*. It usually begins in sheltered depressions where the undergrowth is often very completely mesophytic before a marked change has taken place in the tree vegetation.

Upon morainic uplands this association differs but little from that found upon the dunes except for the presence of the hickories and the frequent occurrence of the bur oak, *Q. macrocarpa*. Depressions in clay upland within this forest are often characterized by the presence of the swamp white oak, *Q. bicolor*, or by the pin oak, *Q. palustris*. *Corylus americana* and *Cornus paniculata* are often the most abundant shrubs of the oak uplands.

Oak forests of this type are to be seen upon the sand dunes at Bridgman and Sawyer, Mich., and in less perfect development at Dune Park and Furnessville, Ind. The uplands at Smith, Ind., at Glencoe, Lake Bluff, Palos Park, New Lenox, and Starved Rock Park, Ill., show developments of oak-hickory forest of the same general type but with certain minor differences of detail.

7. The climax mesophytic forest.—This occurs, not only upon the sand dunes and the morainic uplands, but also upon all soils throughout the northeastern United States and the adjacent parts of Canada. It is dominated in this region by the beech and sugar maple, which often form more than 80 per cent of the tree growth. The hemlock is absent from the uplands of the Chicago region, but is seen upon the adjacent sand dunes of Michigan and in many other localities to the east and north. Perhaps the most conspicuous difference between this association as it occurs upon a clay upland and the corresponding forest upon adjacent sand dunes is the greater richness of the fern flora in the former locality.

The evaporating power of the air in the lower strata of the forest is very low when compared with that of other associations, and at the same time the soil moisture remains constantly well above the wilting coefficient.

This forest is to be seen upon the sand dunes at Sawyer, Mich., and upon the uplands at Three Oaks, Mich., Smith and Otis, Ind.

8. Sandy swamp associations.—From the nature of the recent geologic history of the region a series of old lagoons has been included in the dune area, and these now exist either as small shallow lakes or

ponds or as sandy swamps in various stages of development. No attempt will be made to analyze the various stages in the plant succession from the open water to the forest, but some of the most characteristic plants of the later stages are included in the list. The plants of the open water and earlier swamp stages may be found listed under aquatic associations. The earliest shrubs are commonly the willows and they appear to be succeeded by a forest in which the poplars, pines, red maple, and sour gum are important members. Such transitional associations from the swamp to the dune find their best expression at Miller and Dune Park, Ind.

Dune and Upland Plants[1]—Trees and Shrubs

(7) *Taxus canadensis* Marsh., American yew.
(4) *Pinus Strobus* L., white pine.
(4*) " *Banksiana* Lamb., Jack pine.
(7*) *Tsuga canadensis* Carr., hemlock.
(4) *Thuja occidentalis* L., Arbor vitae.
(4*) *Juniperus communis* L., common juniper.
(4) " *virginiana* L., red cedar.
(4) " *horizontalis* Moench., prostrate juniper.
(3, 4) *Salix longifolia* Muhl., long-leaved willow.
(2, 3, 4) " *syrticola* Fernald, glandular willow.
(2, 3, 4) " *glaucophylla* Bebb, glaucous willow.
(3, 4, 5) " *humilis* Marsh., prairie willow.
(8) *Populus tremuloides* Michx., American aspen.
(8) " *grandidentata* Michx., large-toothed aspen.
(3) " *balsamifera* L., balsam poplar.
(3*) " *deltoides* Marsh., cottonwood.
(5) *Myrica asplenifolia* L., sweet fern.
(8, 7) *Juglans cinerea* L., butternut.
(6) *Carya ovata* (Mill) K. Koch., shag-bark hickory (*u*).
(6) " *cordiformis* (Wang.) K. Koch., bitter-nut hickory (*u*).
(6*) *Corylus americana* Walt., hazelnut (*u*).
(6) *Ostrya virginiana* K. Koch., hop-hornbeam (*u*).
(6) *Carpinus caroliniana* Walt., water-beech or blue beech (*u*).
(7*) *Fagus grandifolia* Ehrh., beech.
(6*) *Quercus alba* L., white oak.
(6*) " *macrocarpa* Michx., bur oak (*u*).
(6) " *imbricaria* Michx., shingle oak (*u*).
(5, 6) " *Muhlenbergii* Engelm., chestnut oak.
(6*, 7) " *rubra* L., red oak.
(5*, 6) " *velutina* Lam., black oak.
(6, 7) *Ulmus fulva* Michx., slippery elm.
(6, 7, 8) " *americana* L., American elm.

[1] The numerals preceding the names indicate the association or associations, outlined in the foregoing paragraphs, in which the plant is usually found. Dominant or very abundant species are indicated by an asterisk (*), while species commonly found upon the uplands only are indicated by (*u*) following the common name.

(5) *Celtis occidentalis pumila* Muhl., dwarf hackberry.
(7) *Liriodendron Tulipifera* L., tulip tree.
(7) *Asimina triloba* Dunal., American papaw.
(5*, 6) *Sassafras variifolium* (Salisb.) Ktze., sassafras.
(7) *Benzoin aestivale* (L.) Nees., spice-bush.
(6) *Ribes Cynosbati* L., prickly gooseberry (*u*).
(6, 7) *Hamamelis virginiana* L., witch-hazel.
(4, 5) *Rosa acicularis* Lindl., wild rose.
(4, 5) " *blanda* Ait., wild rose.
(4, 5) " *humilis* Marsh., wild rose.
(5) *Amelanchier canadensis* Medic., service-berry or shad-bush.
(8) *Pyrus arbutifolia* L., chokeberry.
(5) *Prunus pennsylvanica* L., pin cherry.
(5) " *virginiana* L., chokecherry.
(7) " *serotina* Ehrh., wild black cherry (*u*).
(2*, 3) " *pumila* L., sand cherry.
(5) *Ptelea trifoliata* L., hop-tree.
(4, 5) *Rhus typhina* L., staghorn sumach.
(4, 5) " *copallina* L., dwarf sumach.
(5, 6) " *glabra* L., smooth sumach.
(3, 4, 5, 6) " *Toxicodendron* L., poison-ivy.
(4, 5) " *canadensis* Marsh., aromatic sumach.
(7) *Evonymus obovatus* Nutt., strawberry bush.
(3, 4, 5) *Celastrus scandens* L., climbing bittersweet.
(7*) *Acer saccharum* Marsh., sugar maple.
(8) " *rubrum* L., red maple.
(5) *Ceanothus americanus* L., New Jersey tea.
(4, 5) *Vitis vulpina* L., wild grape.
(4, 5) " *cordifolia* Michx., wild grape.
(4, 5) " *aestivalis* Michx., summer grape.
(4, 5) " *bicolor* Le Conte, summer grape.
(4, 5, 6, 7) *Psedera quinquefolia* (L.), Greene, Virginia creeper.
(6, 7) *Dirca palustris* L., leatherwood.
(4, 6, 7) *Tilia americana* L., basswood or American linden.
(6, 7) *Cornus florida* L., flowering dogwood.
(4, 8) " *stolonifera* Michx., red-osier dogwood.
(7) " *circinata* L'Her., round-leaved dogwood.
(6) " *paniculata* L'Her., panicled dogwood.
(7) " *alternifolia* L., alternate-leaved dogwood (*u*).
(8) *Nyssa sylvatica* Marsh., sour gum.
(4*) *Arctostaphylos Uva-ursi* (L.) Spreng., bearberry.
(5) *Gaylussacia baccata* C. Koch., huckleberry.
(5) *Vaccinium pennsylvanicum* Lamb., blueberry.
(5) " *vacillans* Kalm., late blueberry.
(5*) *Diervilla Lonicera* Mill., bush honeysuckle.
(6) *Lonicera canadensis* Marsh., American fly honeysuckle (*u*).
(5) *Viburnum acerifolium* L., maple-leaved haw.
(7) *Sambucus racemosa* L., red-berried elder.
(7) " *canadensis* L., common elder.

Dune and Upland Plants—Herbaceous

(5) *Pteris aquilina* L., common brake.
(7) *Adiantum pedatum* L., maidenhair fern.
(7) *Asplenium acrostichoides* Sw., golden spleenwort (*u*).
(7) " *angustifolium* Michx., narrow-leaved spleenwort (*u*).
(7) *Polystichum acrostichoides* Schott., Christmas fern.
(7) *Aspidium marginale* Sw., marginal shield fern.
(7) " *spinulosum* Sw., spinulose shield fern.
(7) " *noveboracense* (L) Sw., New York fern (*u*).
(7) " *Goldianum* Hook., Goldie's fern (*u*).
(8) " *Thelypteris* Sw., swamp shield fern.
(6) *Osmunda Claytoniana* L., interrupted fern (*u*).
(6, 7) *Botrychium virginianum* Sw., rattlesnake fern.
(3) *Equisetum arvense* L., common horsetail.
(3) " *hyemale* L., scouring-rush.
(8) " *variegatum* Schleich., variegated horsetail.
(4*) *Andropogon scoparius* Michx., blue stem grass.
(5) *Panicum virgatum* L., switch grass.
(5) " *dichotomum* L., panic grass.
(5, 6) " spp., panic grass.
(2*, 3) *Calamovilfa longifolia* Hack., sand reed-grass.
(2*, 3) *Ammophila arenaria* Link., Marram grass.
(2, 3, 4) *Elymus canadensis* L., rye-grass.
(5) *Koeleria cristata* Pers.
(5) *Sphenopholis obtusata* Scribn.
(5) *Stipa spartea* Trin., porcupine grass.
(5) *Aristida tuberculosa* Nutt., triple-awned grass.
(5) *Festuca octoflora* Walt.
(7) *Hystrix patula* Moench., bottle-brush grass (*u*).
(5) *Carex Muhlenbergii* Schkuhr., Muhlenberg's sedge.
(5) " *pennsylvanica* Lam., Pennsylvania "
(5) " *umbellata* Schkuhr., sedge.
(6, 7) " *eburnea* Boott., sedge.
(7) " *laxiflora* Lam., sedge.
(7) " *plantaginea* Lam., broad-leaved sedge (*u*).
(5) *Cyperus Schweinitzii* Torr.
(5) " *filiculmis* Vahl.
(6) *Luzula campestris* (L) DC., wood rush.
(7) *Arisaema triphyllum* Schott., Indian turnip.
(5) *Tradescantia virginiana* L., spiderwort.
(8) *Juncus balticus littoralis* Willd., sand-rush.
(8) *Tofieldia glutinosa* Pers., false asphodel.
(8) *Lilium philadelphicum* L., wild orange lily.
(7) *Allium tricoccum* Ait., wild leek (*u*).
(7) *Erythronium americanum* Ker., yellow adder's tongue (*u*).
(7) " *albidum* Nutt., white adder's tongue or dog's-tooth violet (*u*).
(6) *Maianthemum canadense* Desf., wild lily-of-the-valley.
(4, 5) *Smilacina stellata* (L.) Desf., false Solomon's seal.
(4, 5) " *racemosa* (L.) Desf., false Solomon's seal.

(7) *Uvularia grandiflora* Sm., bellwort.
(5, 6) *Polygonatum commutatum* Dietr., Solomon's seal.
(6) " *biflorum* (Walt.) Ell., Solomon's seal.
(6) *Trillium recurvatum* Beck., wake robin (*u*).
(6) " *sessile* L., wake robin (*u*).
(6) " *declinatum* (Gray) Gleason, white trillium (*u*).
(7*) " *grandiflorum* Salisb., great white trillium.
(8) *Aletris farinosa* L., colic root.
(7) *Smilax herbacea* L., carrion flower.
(7) " *hispida* Muhl., cat-brier.
(8) *Hypoxis hirsuta* Coville, star-grass.
(6, 7) *Cypripedium parviflorum*, yellow lady's slipper.
(6) *Orchis spectabilis* L., showy orchis (*u*).
(7) *Pilea pumila* (L.) Gray, clearweed (*u*).
(7) *Parietaria pennsylvanica* Muhl., pellitory.
(7) *Laportea canadensis* Gaud., wood nettle.
(5) *Comandra umbellata* Nutt., bastard toadflax.
(5) *Polygonella articulata* Meisn.
(2, 3) *Cycloloma atriplicifolium* Coult., winged pigweed.
(2, 3) *Corispermum hyssopifolium* L., bugseed.
(3, 5) *Salsola Kali tenuifolia* L., Russian thistle.
(7) *Phytolacca decandra* L., poke weed.
(5) *Rumex Acetosella* L., field sorrel.
(5) *Arenaria stricta* Michx., sandwort.
(6) " *lateriflora* L., lateral-flowered sandwort.
(7) *Asarum canadense* L., wild ginger (*u*).
(6) *Silene stellata* (L.) Ait., starry campion (*u*).
(6) *Claytonia virginica* L., spring beauty (*u*).
(7) *Thalictrum dioicum* L., early meadow rue (*u*).
(7) *Anemonella thalictroides* (L.) Spach., rue anemone (*u*).
(7) *Hepatica acutiloba* DC., hepatica.
(7) " *triloba* Chaix., hepatica.
(5) *Anemone cylindrica* Gray, anemone.
(5) " *canadensis* L., anemone.
(6) " *quinquefolia* L., wood anemone (*u*).
(6) " *virginiana* L., anemone.
(5) *Aquilegia canadensis* L., columbine.
(7) *Actaea alba* Mill., white baneberry.
(7) *Isopyrum biternatum* (Raf.) T. & G., false rue anemone.
(6, 7) *Podophyllum peltatum* L., May apple.
(7) *Caulophyllum thalictroides* Michx., blue cohosh.
(7) *Sanguinaria canadensis* L., bloodroot.
(7) *Stylophorum diphyllum* Nutt., celandine poppy.
(7) *Dicentra Cucullaria* Bernh., Dutchman's breeches.
(7) " *canadensis* Walp., squirrel's corn.
(1*, 2, 3) *Cakile edentula* Hook., sea rocket.
(5*) *Arabis lyrata*, rock cress.
(6) *Dentaria laciniata* Muhl., toothwort (*u*).
(7) *Mitella diphylla* L., miterwort.

(6) *Fragaria vesca* L., wood strawberry (*u*).
(6) *Geum virginianum* L., avens.
(6) *Agrimonia* spp., agrimony.
(1, 2) *Potentilla Anserina* L., goose-grass.
(8) " *fruticosa* L., shrubby cinquefoil.
(6) " *canadensis* L., Canada cinquefoil (*u*).
(8) *Spiraea latifolia* Borkh., meadow-sweet.
(8) " *tomentosa* L., steeple bush.
(6) *Desmodium canadensis* DC., tick-trefoil (*u*).
(6) " spp., tick-trefoil.
(5, 6) *Baptisia leucantha* T. &. G., false indigo.
(5*) *Lupinus perennis* L., lupine.
(4) *Petalostemum purpureum* Rydb., prairie clover.
(5) *Tephrosia virginiana* Pers., hoary pea.
(5) *Lespedeza capitata* Mich., bush-clover.
(5) " *violacea* Pers., bush-clover.
(1, 2*) *Lathyrus maritimus* Bigel., beach-pea.
(6) " *venosus* Muhl., vetchling (*u*).
(6) " *ochroleucus* Hook., cream-colored vetchling (*u*).
(2, 3) *Strophostyles helvola* Britton, beach-bean.
(6) *Oxalis violacea* L., violet wood sorrel (*u*).
(6) " *stricta* L., yellow wood sorrel (*u*).
(6, 7) *Geranium maculatum* L., wild geranium.
(5) " *carolinianum* L., wild geranium.
(5) *Polygala polygama* Walt., milkwort.
(1, 2, 3) *Euphorbia polygonifolia* L., seaside spurge.
(5) " *corollata* L., flowering spurge.
(7) *Impatiens biflora* Walt., jewelweed.
(7) " *pallida* Nutt., jewelweed or touch-me-not (*u*).
(4, 5) *Hypericum Kalmianum* L., Kalm's St. John's-wort.
(8) " *prolificum* L., shrubby St. John's-wort.
(5) *Hudsonia tomentosa* Nutt.
(5) *Helianthemum canadense* Michx., frost weed.
(5*) *Viola pedata* L., bird-foot violet.
(5) " *sagittata* Ait., arrow-leaved violet.
(6, 7) " *canadensis* L., Canada violet.
(6, 7) " *cucullata* Ait., blue violet (*u*).
(6, 7) " *rostrata* Pursh, long-spurred violet.
(6) " *palmata* L., palmate blue violet (*u*).
(6) " *conspersa* Reich., dog violet (*u*).
(5) *Opuntia Rafinesquii* Engelm., prickly pear.
(2, 5) *Oenothera biennis* L., common evening primrose.
(2, 5) " *rhombipetala* Nutt., evening primrose.
(7) *Circaea lutetiana* L., enchanter's nightshade.
(5, 6) *Aralia nudicaulis* L., wild sarsaparilla.
(7) *Panax quinquefolium* L., ginseng.
(6, 7) " *trifolium* L., dwarf ginseng.
(7) *Erigenia bulbosa* Nutt., har binger of spring (*u*).
(6) *Taenidia integerrima* Drude, yellow pimpernel (*u*).

(7) *Sanicula marilandica* L., sanicle.
(7) *Cryptotaenia canadensis* DC., honewort.
(5, 6, 7) *Monotropa uniflora* L., Indian pipe.
(4) *Chimaphila umbellata* Nutt., prince's pine.
(4, 6) *Pyrola elliptica* Nutt., shin leaf.
(4) " *secunda* L., shin leaf.
(5) *Epigaea repens* L., May flower; trailing arbutus.
(4, 5) *Gaultheria procumbens* L., aromatic wintergreen.
(8) *Sabbatia angularis* Pursh.
(8) *Gentiana crinita* Froel., fringed gentian.
(8) " *Andrewsii* Griseb., closed gentian.
(6) *Apocynum androsaemifolium* L., dogbane (*u*).
(5) *Asclepias tuberosa* L., butterfly weed.
(2, 3, 5) " *syriaca* L., common milkweed.
(7) " *phytolaccoides* Pursh, poke milkweed.
(5) *Acerates viridiflora* Ell., green milkweed.
(5, 6) *Cuscuta Gronovii* Willd., dodder.
(4, 5, 6) *Phlox pilosa* L., hairy phlox.
(6, 7) " *divaricata* L., blue phlox.
(5*) " *bifida* Beck., cleft phlox.
(6) *Polemonium reptans* L., Jacob's ladder (*u*).
(7) *Hydrophyllum appendiculatum* Mich., waterleaf.
(6) *Mertensia virginica* Link., bluebells or Virginian cowslip (*u*).
(6) *Myosotis virginica* BSP., small white forget-me-not.
(4, 5) *Lithospermum canescens* Lehm., puccoon.
(4*, 5) " *Gmelini* Hitchc., puccoon.
(5) *Monarda fistulosa* L., wild bergamot.
(4, 5) " *punctata* L., horse-mint
(6) *Hedeoma pulegioides* Pers., American pennyroyal.
(3, 5) *Physalis lanceolata* Michx., ground-cherry.
(3, 5) " *virginiana* Mill., ground-cherry.
(5) *Linaria canadensis* Dumont., toadflax.
(6) *Collinsia verna* Nutt., blue-eyed Mary (*u*).
(5) *Gerardia pedicularia* L., false foxglove.
(8) " *purpurea* L., purple gerardia.
(8) *Castilleja coccinea* Spreng., painted-cup.
(5) *Pedicularis canadensis* L., lousewort.
(6) *Melampyrum lineare* Lam., cow wheat.
(8) *Utricularia cornuta* Michx., small bladderwort.
(7) *Epifagus virginiana* Wallr., beech-drops.
(6) *Conopholis americana* Wallr., cancer-root.
(2, 3) *Orobanche fasciculata* Nutt., yellow cancer-root.
(7) *Galium Aparine* L., bed-straw, cleavers.
(6, 7) " *circaezans* Michx., wild liquorice.
(6, 7) " *concinnum* T. & G., shining bedstraw.
(6, 7) *Mitchella repens* L., partridge berry.
(6) *Houstonia caerulea* L., bluets (*u*).
(4, 5) *Campanula rotundifolia* L., bluebell.
(4) *Linnaea borealis americana* Rehder., twin-flower.

(6) *Triosteum perfoliatum* L., horse gentian.
(7) *Eupatorium urticaefolium* Reichard, white thoroughwort.
(5) *Liatris cylindracea* Michx., blazing-star.
(5) " *scariosa* Willd., blazing-star.
(4, 5) *Aster sericeus* Vent.
(4, 5) " *linariifolius* L., narrow-leaved aster.
(8) " *azureus* Lindl., blue aster.
(7) " *cordifolius* L., heart-leaved aster.
(6) " *macrophyllus* L., heart-leaved aster.
(6) *Erigeron pulchellus* Michx., Robin's plantain.
(5) *Solidago speciosa* Nutt., goldenrod.
(2*, 3*) " *racemosa Gillmani* Fernald, goldenrod.
(5) " *nemoralis* Ait., goldenrod.
(2, 3) " *rigida* L., goldenrod.
(5*) " *hispida* Muhl., rough goldenrod.
(6, 7) " *caesia* L., goldenrod.
(5) *Antennaria plantaginifolia* Richards, everlasting.
(1) *Xanthium canadense* Mill., cockle-bur.
(8) *Rudbeckia hirta* L., yellow daisy.
(5) *Helianthus divaricatus* L., sunflower.
(5) " *occidentalis* Riddell, sunflower.
(4) *Coreopsis palmata* Nutt., stiff tickseed.
(4) " *lanceolata* L., lance-leaved tickseed.
(8) " *tripteris* L., tall coreopsis.
(1, 2, 3, 4) *Artemisia caudata* Michx., wormwood.
(1, 2, 3, 4) " *canadensis* Michx., wormwood.
(1, 2, 3) *Cirsium Pitcheri* T. & G., sand-thistle.
(4, 5) *Krigia virginica* Willd., dwarf dandelion.
(5, 6) " *amplexicaulis* Nutt., dwarf dandelion.
(6, 7) *Prenanthes alba* L., rattlesnake root.
(7) *Polymnia uvedalia* L., leafcup.
(5) *Hieracium canadense* Michx., Canada hawkweed.

II. THE PRAIRIE ASSOCIATIONS

Shallow lakes or marshes have apparently one of two destinies, namely, either a forest or a prairie. East of Chicago the former succession is almost universal, but both are to be seen in this region. The stages in plant succession are not always clearly in evidence upon the prairie, but in the following list of species those of the low prairie (1), usually comprising a *Spartina* and a *Calamagrostis* association, are distinguished from those more characteristic of the *Panicum* and the *Poa-Andropogon* associations of the higher prairie (2). HARVEY has shown (Trans. Ill. Acad. Sci. 6:1913) the average evaporation in a prairie association to be about equal to that of the oak dune and the water content of the soil to be decidedly low during the summer months. Comparatively undisturbed prairie areas are to be seen at Chicago Lawn and Ashburn, Ill.

(2) *Andropogon scoparius* Michx., blue-stem grass.
(2*) " *furcatus* Muhl., blue-stem grass.
(1) *Sorghastrum nutans* Nash., Indian grass.
(2*) *Panicum virgatum* L., switch grass.
(2) *Sporobolus heterolepis* Gray, drop-seed grass.
(2) *Agrostis alba* L., red top grass.
(1*) *Calamagrostis canadensis* Beauv., blue-joint grass.
(2) *Koeleria cristata* Pers.
(2) *Danthonia spicata* Beauv., wild oat grass.
(1*) *Spartina Michauxiana* Hitch., cord grass.
(2*) *Poa compressa* L., Canada blue grass.
(2) " *pratensis* L., Kentucky blue grass.
(1*) *Glyceria nervata* Trin., fowl meadow grass.
(2) *Festuca elatior* L., meadow fescue grass.
(2) *Bromus Kalmii* Gray, wild chess.
(2) *Hordeum jubatum* L., squirrel-tail grass.
(2) *Elymus canadensis* L., wild rye.
(1*) *Eleocharis palustris* R. & S., spike rush.
(1) *Cyperus strigosus* L.
(1) *Fimbristylis castanea* Vahl.
(1) *Scirpus lineatus* Michx.
(1) " *fluviatilis* Gray, bulrush.
(1) *Carex scoparia* Schkuhr.
(1) " *cristata* Schwein.
(1) " *Sartwellii* Dewey.
(1) " *stricta* Lam.
(1) " *lanuginosa* Michx.
(1) " *straminea* Willd.
(1) *Juncus nodosus* L., rush.
(1) " *Torreyi* Coville, Torrey's rush.
(1) " *acuminatus* Michx., rush.
(2*) *Allium cernuum* Roth., wild onion.
(2) *Lilium philadelphicum* L., orange lily.
(2) " *canadense* L., wild yellow lily.
(2) *Camassia esculenta* Robinson, wild hyacinth.
(1) *Iris versicolor* L., blue flag.
(2) *Sisyrinchium angustifolium* Mill., blue-eyed grass.
(2) *Comandra umbellata* Nutt., bastard toad-flax.
(2) *Silene antirrhina* L., sleepy catchfly.
(2) *Heuchera hispida* Pursh, alum root.
(2) *Stellaria longifolia* Muhl., long-leaved chickweed.
(2) *Thalictrum dasycarpum* Fisch & Lall., meadow rue.
(2) *Potentilla canadensis* L., Canada cinquefoil.
(2) " *argentea* L., silvery cinquefoil.
(2) " *arguta* Pursh, rough cinquefoil.
(2) *Fragaria virginiana* Duchesne, wild strawberry.
(2) *Amorpha fruticosa* L., false indigo.
(2) " *canescens* Pursh, lead-plant.
(2) *Petalostemum purpureum* Rydb., purple prairie clover.

(2) *Petalostemum candidum* Michx., white prairie clover.
(1) *Lathyrus palustris* L., marsh-pea.
(2) *Desmodium illinoense* Gray, tick-trefoil.
(1) *Polygala sanguinea* L., milkwort.
(1) *Hypericum virgatum* Lam., St. John's-wort.
(1) " *mutilum* L., St. John's-wort.
(1) *Viola papilionacea* Pursh, violet.
(2) " *sagittata* Ait., sagittate violet.
(1) " *pedatifida* G. Don., prairie violet.
(1) *Lythrum alatum* Pursh, winged loosestrife.
(1) *Oenothera pratensis* Robinson, sun-drops.
(2) *Gaura biennis* L.
(2) *Zizia aurea* Koch., golden Alexanders.
(2) *Eryngium yuccifolium* Michx., button snakeroot.
(1) *Cicuta maculata* L., water-hemlock.
(1) *Oxypolis rigidior* (L.) Coult. & Rose., cowbane.
(2) *Dodecatheon Meadia* L., shooting-star.
(2) *Lithospermum canescens* Lehm., puccoon.
(2) *Satureja glabra* Fernald, calamint.
(1) *Steironema quadriflorum* Hitch., loosestrife.
(1) " *lanceolatum* Gray, loosestrife.
(2) *Gentiana puberula* Michx., gentian.
(2) " *flavida* Gray, gentian.
(2) *Apocynum cannabium* L., Indian hemp.
(1) *Asclepias incarnata* L., swamp milkweed.
(1) " *Sullivantii* Englem., Sullivant's milkweed.
(2) " *verticillata* L., verticillate milkweed.
(2) *Acerates floridana* Hitch., green milkweed.
(1) *Convolvulus sepium* L., hedge bindweed.
(2) *Phlox glaberrima* L., smooth phlox.
(2) " *pilosa* L., hairy phlox.
(2) *Cynoglossum officinale* L., hound's-tongue.
(2) *Verbena stricta* Vent., hoary vervain.
(2) *Scutellaria parvula* Michx., small skullcap.
(2) *Physostegia virginiana* Benth., dragon-head.
(1) *Stachys palustris* L., woundwort.
(2) *Pycnanthemum virginianum* L., mountain mint.
(2) " *flexuosum* BSP., mountain mint.
(1) *Lycopus americanus* Muhl., water horehound.
(2) *Chelone glabra* L., snake's-head.
(2) *Veronica virginica* L., Culver's root.
(2) *Gerardia purpurea* L.
(2) " *tenuifolia* Vahl.
(1) *Pentstemon laevigatus* Ait., beard-tongue.
(1) *Mimulus ringens* L., monkey flower.
(2) *Galium boreale* L., northern bedstraw.
(1) " *tinctorium* L., bedstraw.
(1) *Campanula aparinoides* Pursh, marsh bellflower.
(2) *Lobelia spicata* Lam., wild lobelia.

(2) *Vernonia fasciculata* Michx., ironweed.
(2) " *altissima* Nutt., ironweed.
(2) *Kuhnia eupatorioides* L., false boneset.
(2) *Liatris spicata* Willd., blazing star.
(2) " *cylindracea* Michx., blazing star.
(2) " *scariosa* Willd., button snakeroot.
(1) *Boltonia asteroides* L'Her., aster-like Boltonia.
(2) *Solidago rigida* L., rigid goldenrod.
(2) " *canadensis* L., Canada goldenrod.
(2) " *serotina* Ait., late goldenrod.
(1) " *Riddellii* Frank, goldenrod.
(2) " *graminifolia* Salisb., grass-leaved goldenrod.
(2) *Aster novae-angliae* L., New England aster.
(2) " *multiflorus* Ait., many-flowered aster.
(2*) " *vimineus* Lam., many-flowered aster.
(2) " *paniculatus* Lam., panicled aster.
(2) " *ericoides* L., frost-weed aster.
(2) *Erigeron philadelphicus* L., fleabane.
(2) " *ramosus* BSP.
(2) *Antennaria plantaginifolia* Rich., plantain-leaved everlasting.
(2) *Silphium laciniatum* L., compass-plant.
(2) " *terebinthinaceum* Jacq., prairie-dock.
(2) " *integrifolium* Michx., rosinweed.
(2) *Parthenium integrifolium* L., feverfew.
(1) *Rudbeckia triloba* L., thin-leaved cone-flower.
(2) " *hirta* L., black-eyed-Susan.
(2) *Heliopsis helianthoides* Sweet, ox-eye.
(2) *Lepachys pinnata* T. & G., cone flower
(2) *Helianthus strumosus* L., sunflower.
(2) " *grosseserratus* Martens, sunflower.
(2) " *scaberrimus* Ell., sunflower.
(2) *Cacalia tuberosa* Nutt., Indian plantain.
(1) *Senecio aureus* L., golden ragwort.
(1) " *Balsamitae* Muhl., golden ragwort.
(2) *Cirsium virginianum* (L.) Michx., thistle.
(1) " *altissimum* (L.) Spreng., thistle.
(2) " *pumilum* Spreng., pasture thistle.
(2) " *lanceolatum* Hill., bull thistle.
(2) *Krigia amplexicaulis* Nutt., Virginia goatsbeard.
(2) *Lactuca canadensis* L., wild lettuce.
(2) " *ludoviciana* Riddell, wild lettuce.

III. AQUATIC ASSOCIATIONS

These associations reach their best development in the shallow lakes and ponds of the old lake plain and in the depressions in the sand dune area. Others are found in connection with the development of the stream system. The succession in these ponds, streams, and swamps

may lead to either a grassland or a forest. Only seed plants and ferns are included in the following lists which are classified to indicate the (1) submerged, (2) floating-leaved, and (3) emergent aquatics, the (4) reed, and the (5) sedge swamp associations. Subsequent stages in the successions are given under the prairie, peat bog, and flood plain associations. Among the many localities in which aquatic vegetation is to be found some of the best are at Miller, Long Lake, Pine, Wolf, and Calumet lakes, Ind., Skokie Marsh and Fox Lake, Ill.

Shrubs

(3) *Salix amygdaloides* Anders., peach-leaved willow.
(3) " *cordata* Muhl., heart-leaved willow.
(3) " *glaucophylla* Bebb, glaucous willow.
(3) " *longifolia* Muhl., sand-bar willow.
(3) " *discolor* Muhl., glaucous willow.
(3) *Cephalanthus occidentalis* L., buttonbush.

Herbaceous Plants

(5) *Selaginella apus* Spreng., marsh selaginella.
(3) *Equisetum variegatum* Schleich., variegated horsetail.
(3) *Equisetum fluviatile* L., swamp horsetail.
(4*) *Typha latifolia* L., common cat-tail.
(4*) " *angustifolia* L., narrow-leafed cat-tail.
(3*) *Sparganium eurycarpum* Engelm., bur-reed.
(2*) *Potamogeton natans* L., pondweed.
(2) " *americanus* C. & S., American pondweed.
(2) " *amplifolius* Tuckerm., broad-leaved pondweed.
(1*) " *crispus* L., crisp pondweed.
(1) " *lucens* L., shining pondweed.
(1*) " *zosterifolius* Schu., grass-leaved pondweed.
(1*) " *pectinatus* L., narrow-leaved pondweed.
(1) " *Robbinsii* Oakes, Robbin's pondweed.
(1) *Zannichellia palustris* L., horned pondweed.
(1*) *Najas flexilis* R. & S., naiad.
(4) *Triglochin maritima* L., arrow grass.
(3*) *Sagittaria latifolia* Willd., arrow-head.
(3) " *heterophylla* Pursh, arrowweed.
(3) " *graminea* Michx., narrow arrow-head.
(3) *Alisma plantago-aquatica* L., water plantain.
(1*) *Elodea canadensis* Michx., water-weed.
(1) *Vallisneria spiralis* L., tape grass.
(3, 5) *Calamagrostis canadensis* Beauv., blue-joint grass.
(4*) *Phragmites communis* Trin., reed.
(5) *Spartina Michauxiana* Hitch., cord grass.
(3) *Zizania aquatica* L., wild rice.
(3) *Eleocharis palustris* R. & S., spike rush.
(3, 5) " *tenuis* Schultes, spike rush.

(5) *Eleocharis acicularis* R. & S., spike rush.
(3*) *Scirpus validus* Vahl., great bulrush.
(3*) " *fluviatilis* Gray, river bulrush.
(4, 5) " *americanus* Pers., triangular bulrush.
(2) *Dulichium arundinaceum* Britton.
(1*) *Carex lanuginosa* Michx., woolly sedge.
(5) " *filiformis* L., slender sedge.
(5) " *aurea* Nutt., golden sedge.
(5*) " *stricta* Lam., narrow sedge.
(5) " spp., sedges.
(5) *Rynchospora capillacea* Torr., beak rush.
(5) *Cladium mariscoides* Torr., twig rush.
(3) *Symplocarpus foetidus* Nutt., skunk cabbage.
(3, 5) *Peltandra virginica* Knuth., arrow arum.
(4) *Acorus calamus* L., sweet flag.
(2*) *Spirodela polyrhiza* Schleid., duckweed.
(1*) *Lemna trisulca* L., duckweed.
(2*) " *minor* L., duckweed.
(2) *Wolffia columbiana* Karst., smallest duckweed.
(3*) *Pontederia cordata* L., pickerel-weed.
(3) *Heteranthera dubia* MacM., water star-grass.
(5) *Juncus nodosus* L., knotted rush.
(5) " *canadensis* Gay., Canada rush.
(5) " *balticus* Willd., Baltic rush.
(3, 5) *Iris versicolor* L., blue flag.
(3) *Saururus cernuus* L., lizard's tail.
(1, 3, 5) *Polygonum amphibium* L., water smartweed.
(1, 3, 5) " *Muhlenbergii* Wats., water smartweed.
(3, 5) " *hydropiperoides* Michx., water pepper.
(1*) *Ceratophyllum demersum* L., hornwort.
(2*) *Nymphaea advena* Ait., yellow pond lily.
(2*) *Castalia tuberosa* Greene, white water lily.
(2*) *Brasenia Schreberi* Gmel., water shield.
(2) *Nelumbo lutea* Pers., American lotus or nelumbo.
(1) *Ranunculus aquatilis* L., white water buttercup.
(1) " *delphinifolius* Torr., yellow water buttercup.
(5) " *pennsylvanicus* L., bristly buttercup.
(3) *Caltha palustris* L., marsh marigold.
(1, 3) *Radicula Nasturtium-aquatica* B. & R., water cress.
(1) " *aquatica* Rob., lake cress.
(3) " *palustris* Moench., marsh cress.
(3) *Cardamine hirsuta* L., bitter cress.
(3, 5) *Penthorum sedoides* L., ditch stonecrop.
(3) *Potentilla palustris* Scop., marsh cinquefoil.
(2) *Callitriche palustris* L., water starwort.
(5) *Hypericum virginicum* L., marsh St. John's-wort.
(3) " *canadense* L., Canada St. John's-wort.
(5) *Lythrum alatum* Pursh, winged loosestrife.
(3, 5) *Ludvigia palustris* Ell., water purslane.

(5) *Epilobium molle* Torr., willow-herb.
(1*) *Myriophyllum spicatum* L., water milfoil.
(1*) " *heterophyllum* Michx., water milfoil.
(3) *Proserpinaca palustris* L., mermaid-weed.
(3) *Hippuris vulgaris* L., mare's tail.
(3, 5) *Sium cicutaefolium* Schrank., water parsnip.
(3, 5) *Cicuta bulbifera* L., bulb-bearing water hemlock.
(5) " *maculata* L., water hemlock.
(5) *Lysimachia thyrsiflora* L., tufted loosestrife.
(5) " *terrestris* BSP., bulbous loosestrife.
(3) *Menyanthes trifoliata* L., buckbean.
(5) *Asclepias incarnata* L., swamp milkweed.
(5) *Verbena hastata* L., blue vervain.
(5) *Scutellaria galericulata* L., marsh skullcap.
(5) *Lycopus americanus* Muhl., water horehound.
(5) " *virginicus* L., bugle weed.
(5) *Mentha arvensis canadensis* L., Canada mint.
(3) *Veronica Anagallis-aquatica* L., water speedwell.
(1*) *Utricularia vulgaris* L., bladderwort.
(1) " *minor* L., smaller bladderwort.
(1) *Dianthera americana* L., water willow.
(3) *Plantago cordata* Lam., river plantain.
(5) *Galium asprellum* Michx., marsh bedstraw.
(3, 5) *Campanula aparinoides* Pursh., marsh bellflower.
(5) *Eupatorium purpureum* L., Joe-Pye weed.
(5) " *perfoliatum* L., boneset or thoroughwort.
(5) *Solidago graminifolia* Salisb., grass-leaved goldenrod.
(5) *Cirsium muticum* Michx., swamp thistle.
(5) *Bidens trichosperma* Britton, marsh stick-tight.
(5) " *frondosa* L., beggar-tick.

IV. THE PEAT BOG ASSOCIATIONS

The associations in the peat bog series that are best developed are (1) the sedge, (2) the xerophytic shrub, (3) the tamarack, and (4) the pine-birch forest associations. No separate discussion of the stages in the succession will be attempted but the association in which the following species occur most abundantly will be indicated. These associations are seen at Mineral Springs and Mill Creek, Ind., and Fox Lake, Ill.

Trees and Shrubs

(4*) *Pinus Strobus* L., white pine.
(4) *Thuja occidentalis* L., arbor vitae.
(3*) *Larix laricina* Koch., tamarack or American larch.
(1, 2) *Salix pedicellaris* Pursh.
(1, 2) " *candida* Flugge, hoary willow.
(2) " *discolor* Muhl., glaucous willow.

(4) *Betula lutea* Michx., yellow birch.
(4) " *pumila* L., dwarf birch.
(2, 3) *Alnus incana* Moench., hoary alder.
(4) *Ulmus americana* L., American elm.
(3, 4) *Rubus hispidus* L., low swamp blackberry.
(3, 4) " *villosus* Ait., dewberry.
(3, 4) " *triflorus* Richards, dwarf raspberry.
(3, 4) " *idaeus* L., red raspberry.
(2*) *Rosa carolina* L., swamp rose.
(4) *Pyrus arbutifolia* L., chokeberry.
(4) *Amelanchier canadensis* Medic., service-berry.
(2*) *Rhus Vernix* L., poison-sumach.
(2, 3) *Ilex verticillata* Gray, northern-holly.
(2, 3) *Nemopanthus mucronata* Trel., mountain-holly.
(4*) *Acer rubrum* L., red maple.
(2, 3) *Rhamnus alnifolia* L'Her., swamp buckthorn.
(4) *Tilia americana* L., basswood or American linden.
(3*) *Chamaedaphne calyculata* Moench., cassandra.
(3) *Andromeda polifolia* L., Andromeda.
(3, 4) *Vaccinium corymbosum* L., tall blueberry.
(1) " *macrocarpon* Ait., cranberry.
(2, 3) *Cornus stolonifera* Michx., red-osier dogwood.
(3) " *canadensis* L., dwarf dogwood.
(4) *Nyssa sylvatica* Marsh., sour gum.
(4) *Sambucus racemosa* L., red-berried elder.
(4) *Lonicera dioica* L., swamp honeysuckle.

Herbaceous Plants

(3, 4) *Osmunda regalis* L., royal fern.
(3, 4) " *Claytoniana* L., interrupted fern.
(3, 4) " *cinnamomea* L., cinnamon fern.
(3*, 4) *Onoclea sensibilis* L., sensitive fern.
(1*, 2) *Aspidium Thelypteris* Sw., swamp fern.
(3, 4) " *cristatum* Sw., cristate shield fern.
(2*) *Woodwardia virginica* Sm., chain fern.
(1) *Glyceria nervata* Trin., manna grass.
(1) *Zizania aquatica* L., wild rice.
(1) *Dulichium arundinaceum* Britton.
(1*) *Eleocharis rostellata* Torr., spike-rush.
(1) " *palustris* (L.) R. & S., spike-rush.
(1) *Scirpus validus* Vahl., great bulrush.
(1) " *cyperinus* Kunth., wool grass.
(1) " *atrovirens* Muhl., dark green bulrush.
(1) *Cyperus strigosus* L., straw-colored cyperus.
(1) " *erythrorhizos* Muhl.
(1) " *Engelmanni* Steud.
(1) *Eriophorum virginicum* L., cotton grass.
(1) *Cladium mariscoides* Torr., twig-rush.

(1) *Scleria triglomerata* Michx., nut-rush.
(1) *Rynchospora glomerata* (L.) Vahl., beak-rush.
(3) *Carex trisperma* Dewey, soft-leaved sedge.
(1, 3) " *stellulata* Good, prickly sedge.
(1) " *tenella* Schkuhr., sedge.
(1) " *crinita* Lam., fringed sedge.
(1) " *filiformis* L., slender sedge.
(1) " *Pseudo-Cyperus* L., cyperus sedge.
(1) *Juncus tenuis* Willd., slender rush.
(3, 4) *Maianthemum canadense* Desf., wild lily-of-the-valley.
(1, 2) *Iris versicolor* L., blue flag.
(3) *Cypripedium parviflorum* Salisb., yellow lady's slipper.
(2) " *hirsutum* Mill., showy lady's slipper.
(1, 2) " *candidum* Muhl., white lady's slipper.
(4) " *acaule* Ait., stemless lady's slipper.
(1, 3) *Habenaria hyperborea* (L.) R.Br., rein orchis.
(1, 3) " *clavellata* Spreng., rein orchis.
(1, 3) " *ciliaris* R.Br., fringed orchis.
(1) " *blephariglottis* Torr., white fringed orchis.
(1) " *psycodes* Sw., purple fringed orchis.
(1) *Calopogon pulchellus* R.Br.
(1) *Spiranthes cernua* (L.) Richards, ladies' tresses.
(3) *Pilea pumila* Gray, clear weed.
(1) *Boehmeria cylindrica* Sw., false nettle.
(2) *Thalictrum dasycarpum* F. & L., meadow rue.
(1) *Sarracenia purpurea* L., pitcher-plant.
(2) *Drosera rotundifolia* L., sundew.
(2) " *longifolia* L., sundew.
(3) *Saxifraga pennsylvanica* L., swamp saxifrage.
(3) *Chrysosplenium americanum* Schwein., golden saxifrage.
(1) *Parnassia caroliniana* Michx., grass of Parnassus.
(3, 4) *Coptis trifolia* Salisb., goldthread.
(2) *Spiraea latifolia* Borkh., meadow-sweet.
(2) " *tomentosa* L., hardhack.
(1) *Viola lanceolata* L., lance-leaved violet.
(1) " *pallens* Brainerd, sweet white violet.
(4) *Aralia nudicaulis* L., wild sarsaparilla.
(1*, 2) *Decodon verticillatus* Ell., water willow.
(4) *Trientalis americana* Pursh, star-flower.
(3, 4) *Galium triflorum* Michx., sweetscented bedstraw.
(4) *Mitchella repens* L., partridge berry.
(3) *Myosotis laxa* Lehm., forget-me-not.
(3) *Linnaea borealis* L., twinflower.
(1) *Solidago patula* Muhl., bog goldenrod.
(1) " *neglecta* T. & R., bog goldenrod.
(1) *Aster puniceus* L., bog aster.
(1) *Bidens trichosperma* Britton, tickseed.

V. THE ROCK RAVINE ASSOCIATIONS

Well-developed narrow rock ravines with nearly perpendicular sides are so well shaded and the air currents are so reduced that the evaporating power of the air is reduced to a minimum. This permits the development of associations of liverworts, mesophytic mosses, delicate ferns, and extreme shade plants such as *Impatiens* and *Pilea*. Upon ledges along the sides of the canyons and at the foot of the walls as soon as sufficient soil accumulates a herbaceous and shrub vegetation similar to the undergrowth of the climax mesophytic forest (*q.v.*) makes its appearance. With the widening of the canyon and the accumulation of talus the trees of the same forest appear, while as the floor of the canyon widens the vegetation of the flood plain (*q.v.*) develops upon it. The upper edges of the ravine have a vegetation similar to that of the river bluff (*q.v.*).

In the following lists only the more characteristic species of some small limestone canyons near Sag and Lemont, Ill., and of the large sandstone canyons of Starved Rock Park are included. No attempt will be made to list the mosses or leafy liverworts, but the thallose liverworts include: *Riccia natans*, *Marchantia polymorpha*, *Reboulia* sp., *Aneura pinguis*, *Pellia epiphylla*, *Blasia pusilla*, *Scapania* (*nemorosa?*), *Cephalozia* sp., and *Anthoceros laevis*.

Trees and Shrubs

Taxus canadensis Marsh., American yew.
Asimina triloba Dunal., American papaw.
Hydrangea arborescens L., wild hydrangea.
Ribes Cynosbati L., gooseberry.
Aruncus sylvester Kosteletzsky, goat's-beard.

Herbaceous Plants

Phegopteris polypodioides Fee, beech-fern.
Asplenium angustifolium Michx., narrow-leaved spleenwort.
Cystopteris bulbifera (L.) Bernh., bulb-bearing fern.
" *fragilis* (L.) Bernh., fragile fern.
Cryptogramma Stelleri Prantl, slender cliff-brake.
**Pilea pumila* (L.) Gray, clearweed.
Parietaria pennsylvanica Muhl., pellitory.
Saxifraga pennsylvanica L., swamp saxifrage.
**Arabis brachycarpa* Britton, rock cress.
" *laevigata* Poir., rock cress.
Impatiens biflora Walt., spotted touch-me-not.
Aralia racemosa L., wild spikenard.
Solidago latifolia L., broad-leaved goldenrod.

VI. THE RIVER CLIFF ASSOCIATIONS

With the exception of a few poorly developed limestone cliffs along the Des Plaines River and its tributaries there are no rock cliffs in the immediate Chicago region. High limestone cliffs are to be seen on the Mississippi at Savanna, Ill., while at Starved Rock Park are cliffs consisting of rather easily eroded sandstone which permits the rapid development of mosses and seed plants but is unfavorable to the growth of lichens. Among the mosses several species of *Polytrichum* (e.g., *P. juniperinum* and *P. piliferum*) are prominent. In even slightly protected situations a layer of sandy soil soon accumulates, hence it is not surprising that upon level and gently sloped areas a vegetation similar to the oak associations of the sand dunes (*q.v.*) soon becomes established. Many of the plants in the following list are quite as characteristic of river banks of clay as of the rock cliffs.

Trees and Shrubs

Pinus Strobus L., white pine.
Thuja occidentalis L., arbor vitae.
**Juniperus virginiana* L., red cedar.
Populus tremuloides Michx., American aspen.
" *grandidentata* Mich., large-toothed aspen.
**Ostrya virginiana* K. Koch., hop-hornbeam.
Carpinus caroliniana Walt., water-beech.
Ribes Cynosbati L., prickly gooseberry.
**Physocarpus opulifolius* Maxim., nine-bark.
Crataegus tomentosa L., red haw.
" spp., haws or thorn apples.
Amelanchier canadensis (L.) Medic., service-berry.
Prunus virginiana L., chokecherry.
Pyrus arbutifolia L., chokeberry.
Ptelea trifoliata L., hop tree.
Rhus glabra L., smooth sumach.
* " *typhina* L., rough sumach.
" *Toxicodendron* L., poison-ivy.
Ilex verticillata (L.) Gray, northern holly.
Celastrus scandens L., climbing bittersweet.
Vaccinium pennsylvanicum Lam., blueberry.
" *canadense* Kalm., blueberry.
**Lonicera Sullivantii* Gray, Sullivant's honeysuckle.
**Viburnum prunifolium* L., plum-leaved haw.

Herbaceous Plants

Selaginella rupestris (L.) Spring.
Polypodium vulgare L., polypody fern.
Pellaea atropurpurea Link., purple cliff-brake.
Pteris aquilina L., common brake.

Camptosorus rhizophyllus Link., walking fern.
Panicum dichotomum L., prairie-grass.
Cenchrus tribuloides L., sand-bur.
Poa compressa L., wire-grass.
Festuca octoflora Walt., fescue-grass.
Hordeum jubatum L., squirrel-tail grass.
Carex Muhlenbergii Schkuhr.
Cerastium nutans Raf., chickweed.
Talinum teretifolium Pursh, flame flower.
Heuchera hispida Pursh, alum-root.
Ranunculus fascicularis Muhl., early fascicled buttercup.
Aquilegia canadensis L., columbine.
Draba caroliniana Walt., spring draba.
Vicia caroliniana Walt., pale vetch.
" *americana* Muhl., American vetch.
Amorpha canescens Pursh, lead-plant.
Oxalis stricta L., yellow wood sorrel.
" *violacea* L., violet wood sorrel.
Polygala Senega L., Seneca snakeroot.
Taenidia integerrima Drude, yellow pimpernel.
Dodecatheon Meadia L., shooting star.
Asclepias verticillata L., verticillate milkweed.
Verbena angustifolia Michx., narrow-leaved vervain.
" *stricta* Vent., hoary vervain.
Scutellaria parvula Michx., small skullcap.
Linaria canadensis (L.) Dumont., toadflax.
Pentstemon hirsutus Willd., hairy beard-tongue.
Orobanche uniflora L., cancer root.
Houstonia caerulea L., bluets.
Myosotis virginica (L.) BSP., white forget-me-not.
Specularia perfoliata (L.) A. DC., Venus' looking-glass.
Campanula rotundifolia L., harebell.
Solidago nemoralis Ait., goldenrod.
Aster ptarmicoides T. & G., upland white aster.
Antennaria plantaginifolia (L.) Richards, everlasting.
Brauneria angustifolia Heller, purple coneflower.
Achillea Millefolium L., yarrow.

VII. THE FLOOD-PLAIN ASSOCIATIONS

From the nature of their physiography there are many species common to the climax mesophytic forest (*q.v.*) and the fairly mature flood plain. The earlier stages of the latter are characterized by a number of rapidly growing trees and a herbaceous undergrowth of great luxuriance, in which the broad "shade leaf" is seen at its highest development. Nowhere is the development of climbing and twining plants so abundant. The different stages in the development of the flood-plain vegetation are not distinguished in the following list of species. In the list are

included plants of depressions in the uplands that give rise to swampy conditions, while many plants of the water's edge will be found in the list of aquatics (*q.v.*). Swampy depressions in the morainic uplands are common throughout the moraine deposits, and some of the best examples of flood-plain associations may be seen along the Galien River at Three Oaks, Mich., along the Illinois River at Starved Rock Park, along the Des Plaines River at Riverside and River Forest, and along the Chicago River at Edgebrook.

Trees and Shrubs

**Salix nigra* Michx., black willow.
" *amygdaloides* Anders., peach-leaved willow.
" *longifolia* Muhl., sand bar willow.
Populus deltoides Marsh., cottonwood.
Juglans cinerea L., butternut.
" *nigra* L., black walnut.
Carya cordiformis K. Koch., bitter-nut hickory.
Quercus macrocarpa Michx., bur oak.
" *palustris* Muench., pin oak.
" *bicolor* Willd., swamp white oak.
Ulmus fulva Michx., slippery elm.
" *americana* L., American elm.
Celtis occidentalis L., hackberry.
Morus rubra L., red mulberry.
Menispermum canadense L., moonseed.
Platanus occidentalis L., sycamore.
Clematis virginiana L., virgin's-bower.
Benzoin aestivale Nees., spice bush.
Ribes Cynosbati L., prickly gooseberry.
" *floridum* L'Her., wild black currant.
**Crataegus punctata* Jacq., punctate haw.
* " *mollis* Scheele., red haw.
" spp., haws or thorn apples.
Pyrus coronaria L., American crab.
Prunus serotina Ehrh., wild black cherry.
" *americana* Marsh., wild plum.
Gleditsia triacanthos L., honey-locust.
Cercis canadensis L., redbud.
Gymnocladus dioica (L.) Koch., Kentucky coffee-tree.
Amorpha fruticosa L.
Zanthoxylum americanum Mill., prickly ash.
Rhus Toxicodendron L., poison ivy.
Evonymus atropurpureus Jacq., waahoo or burning bush.
" *obovatus* Nutt., strawberry-bush.
Staphylea trifolia L., bladdernut.
**Acer saccharinum* L., white maple.
" *Negundo* L., box-elder.

Vitis cordifolia Michx., frost-grape.
" *vulpina* L., river-bank grape.
Psedera quinquefolia (L.) Greene, Virginia creeper.
**Tilia americana* L., basswood.
**Fraxinus americana* L., white ash.
" *nigra* Marsh., black ash.
" *quadrangulata* Michx., blue ash.
Sambucus canadensis L., common elder.
Viburnum Lentago L., sweet viburnum or black haw.

Herbaceous Plants

**Onoclea sensibilis* L., sensitive fern.
" *Struthiopteris* Hoffm., ostrich fern.
Osmunda Claytoniana L., interrupted fern.
" *regalis* L., royal fern.
* " *cinnamomea* L., cinnamon fern.
Elymus virginicus L., wild rye.
**Arisaema triphyllum* Schott., Indian turnip or Jack-in-the-pulpit.
" *Dracontium* Schott., green dragon.
Symplocarpus foetidus Nutt., skunk cabbage.
Uvularia grandiflora Sm., bellwort.
**Allium tricoccum* Ait., wild leek.
" *canadense* L., wild onion or garlic.
Erythronium americanum Ker., yellow adder's tongue.
* " *albidum* Nutt., white adder's tongue.
Trillium recurvatum Beck., wake-robin.
Polygonatum biflorum Ell., small Solomon's seal.
" *commutatum* Dietr., great Solomon's seal.
Smilax herbacea L., carrion flower.
" *hispida* Muhl., cat-brier.
Dioscorea villosa L., wild yam.
Urtica gracilis Ait., nettle.
**Laportea canadensis* (L.) Gaud., wood-nettle.
Pilea pumila (L.) Gray, clearweed.
Parietaria pennsylvanica Muhl., pellitory.
Asarum canadense L., wild ginger.
**Polygonum virginianum* L., smartweed.
Polygonum scandens L., climbing false buckwheat.
Silene virginica L., fire pink.
" *stellata* Ait., starry campion.
**Claytonia virginica* L., spring beauty.
Ranunculus septentrionalis Poir., early buttercup.
" *recurvatus* Poir., hooked buttercup.
* " *abortivus* L., abortive buttercup.
Clematis virginiana L., virgin's bower.
Isopyrum biternatum T. & G.
Caltha palustris L., marsh marigold.
Caulophyllum thalictroides Michx., blue cohosh.
Dentaria laciniata Muhl., toothwort.

Cardamine bulbosa BSP., spring cress.
* " *Douglasii* Britton, spring cress.
Geum canadense Jacq., avens.
" *Virginianum* L., avens.
Desmodium grandiflorum DC., tick-trefoil.
Apios tuberosa Moench, groundnut.
Amphicarpa monoica Ell., hog peanut.
Floerkea proserpinacoides Willd., false mermaid.
Impatiens biflora Walt., jewel weed.
Hibiscus Moscheutos L., swamp rose mallow.
" *militaris* Cav., halberd-leaved rose mallow.
**Viola cucullata* Ait., blue violet.
* " *sororia* Willd., blue violet.
" *pubescens* Ait., yellow violet.
Circaea lutetiana L., enchanter's nightshade.
Aralia nudicaulis L., wild sarsaparilla.
**Sanicula marilandica* L., sanicle.
Osmorhiza Claytoni Clarke, sweet Cicely.
" *longistylis* DC., sweet Cicely.
**Cryptotaenia canadensis* (L.) DC., honewort.
Heracleum lanatum Michx., cow-parsnip.
Chaerophyllum procumbens Crantz.
Angelica atropurpurea L., angelica.
Lysimachia Nummularia L., moneywort.
**Steironema ciliatum* Raf., fringed loosestrife.
Asclepias phytolaccoides Pursh, poke milkweed.
Convolvulus sepium L., bindweed.
Ipomea pandurata L., man-of-the-earth.
Cuscuta Gronovii Willd., dodder.
**Phlox divaricata* L., blue phlox.
Polemonium reptans L., Jacob's ladder.
Hydrophyllum macrophyllum Nutt., waterleaf.
" *virginianum* L., waterleaf.
" *appendiculatum* Michx., waterleaf.
Ellisia Nyctelea L.
Phacelia bipinnatifida Michx.
Mertensia virginica Link., Virginia cowslip or bluebells.
Teucrium canadense L., American germander.
Scutellaria lateriflora L., skullcap.
Stachys palustris L., woundwort.
Lycopus virginicus L., bugleweed.
Sicyos angulatus L., bur-cucumber
Echinocystis lobata T. & G., wild balsam-apple.
Campanula americana L., tall bellflower.
Lobelia siphilitica L., great lobelia.
Eupatorium purpureum L., Joe-Pye weed.
Silphium perfoliatum L., cup-plant.
Ambrosia trifida L., great ragweed.
" *artemisiifolia* L., common ragweed.

Rudbeckia laciniata L., wild goldenglow.
Helianthus tuberosus L., Jerusalem artichoke.
Cacalia atriplicifolia L., Indian plantain.

VIII. THE LAKE CLIFF ASSOCIATIONS

The shore of Lake Michigan, north of Chicago, exhibits a series of high clay cliffs cut in the moraine. These differ in slope according to the character of the soil and in their vegetation according to whether or not they are being attacked by waves at the present time. The earliest plant associations consist of the antecedent vegetation which has slumped from the upland together with shrubs and perennial herbs with means of rapid vegetative propagation which enable them to compete with the unstable substratum. Only the plants peculiar to the pioneer stages of the succession are included in the following list, as those of the beach and the mixed oak forest differ very little from corresponding associations upon the sand dunes (*q.v.*). The ravines opening upon the shore have the vegetation of the lake cliffs upon their exposed slopes and that of the mesophytic forest (*q.v.*) and flood plain (*q.v.*) upon the more protected areas.

Trees and Shrubs

Pinus Strobus L., white pine.
Juniperus virginiana L., red cedar.
" *communis* L., common juniper.
Thuja occidentalis L., arbor vitae.
Salix discolor Muhl., pussy-willow.
" *glaucophylla* Bebb, glaucous willow.
Populus tremuloides Michx., aspen.
" *grandidentata* Michx., large-toothed aspen.
" *balsamifera* L., balsam poplar.
Corylus americana Walt., hazelnut.
Ostrya virginiana (Mill) K. Koch., hop-hornbeam.
Carpinus caroliniana Walt., ironwood.
Betula alba papyrifera Spach., white birch.
Amelanchier canadensis (L.) Medic., service-berry.
Rosa blanda Ait., wild rose.
" *humilis* Marsh., wild rose.
Prunus virginiana L., chokecherry.
Acer Negundo L., box-elder.
Rhus typhina L., staghorn sumach.
" *glabra* L., smooth sumach.
" *Toxicodendron* L., poison-ivy.
Ceanothus americana L., New Jersey tea.
Shepherdia canadensis (L.) Nutt., buffalo-berry.
Elaeagnus argentea Pursh, silverberry.
Tilia americana L., basswood.

Cornus paniculata L'Her., panicled dogwood.
" *stolonifera* Michx., red-osier dogwood.
Viburnum Lentago L., black haw.
" *Opulus* L., cranberry tree.

Herbaceous Plants

Equisetum arvense L., common horsetail.
" *hyemale* L., scouring-rush.
Poa compressa L., Canada blue-grass.
Elymus canadensis L., Canada rye grass.
Potentilla Anserina L., goose-grass.
" *canadensis* L.
Melilotus alba Desr., sweet clover.
Astragalus canadensis L., milk vetch.
Vicia americana Muhl., purple vetch.
" *caroliniana* Walt., pale vetch.
Lathyrus ochroleucus Hook., pale vetchling.
Polygala Senega L., Seneca snakeroot.
Gentiana quinquefolia L., stiff gentian.
Apocynum androsaemifolium L., dogbane.
Asclepias syriaca L., common milkweed.
Aster laevis L., smooth aster.
" *multiflorus* Ait., many flowered aster.
Solidago arguta Ait., plume goldenrod.
Helianthus divaricatus L., sunflower.
Rudbeckia hirta L., black-eyed-Susan.

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